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(54) Improved television receiver monitoring apparatus.

(57) An apparatus for monitoring the channel to which a television receiver is tuned regardless of whether or not the video signal passes through a video cassette recorder or cable television tuner. Signals inductively produced by the receiver are compared with like signals from a slave receiver which is tuned automatically by a sequencer to each channel in turn. The sequencer halts if the signals match, and steps the slave receiver to the next channel if there is no match. The apparatus uses digital pulse techniques and incorporates time delays to obtain signal matching whether the master receiver is tuned with or without a video cassette recorder or cable television tuner.

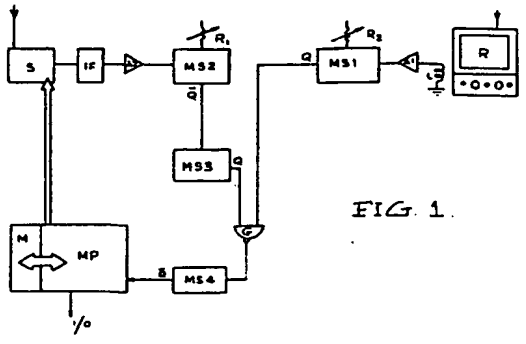

FIG. 1

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IMPROVED TELEVISION RECEIVER MONITORING APPARATUS

This invention relates to an apparatus for monitoring a television receiver. In particular, it relates to an apparatus for monitoring the channel to which a television receiver is tuned.

Television receivers produce varying magnetic fields of low frequency such as emanate from the loudspeaker transformer or the yoke of the cathode-ray tube. These varying magnetic fields can be used to induce an electrical signal in a loop or coil of wire, which signal is unique to the video/audio content of the channel to which the receiver is tuned. This phenomenon can be used to monitor the tuning of the receiver, that is to monitor the channel being viewed at any particular time.

One known monitoring apparatus electrically compares the induced signal with a signal produced by a slave receiver. If the signals coincide, this fact is recorded on a memory or the like; if there is no coincidence, the apparatus sequentially tunes the slave receiver to each available channel until there is coincidence. As the known monitoring apparatus employ mathematical or analogue techniques to compare signals from the master and slave receivers, they are not capable of satisfactory operation if the master receiver is tuned by way of a video cassette recorder or cable television tuner interposed between antenna/cable and master receiver. These devices produce a time delay in the signal path to the master receiver, and the known apparatus cannot compensate for this time delay.

The object of this invention is to provide an improved television monitoring apparatus which employs digital techniques to compensate for time delays produced by extra tuning devices (such as video recorder or cable television tuner) interposed between transmission source (antenna or cable) and master receiver.

Accordingly, this invention provides apparatus for monitoring the channel to which a master television receiver is tuned, comprising means to produce a first pulse train

characteristic of the video or audio content of the television channel to which the master receiver is tuned, means to produce a second pulse train characteristic of the video or audio content of the channel to which a slave receiver is tuned, means to compare the first and second pulse trains and produce a further pulse if the first and second pulse trains do not coincide, and means responsive to the further pulse to sequentially tune the slave receiver to the next available channel, characterized in that the duration of the pulses of the first pulse train are sufficient to enable the corresponding pulses of the second train to coincide with those of the first pulse train when the first pulses are delayed by passing through an auxilliary tuning device interposed between the source of the video signal and the master receiver.

One embodiment of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 schematically illustrates the apparatus of the invention;

Figure 2 schematically illustrates part of Figure 1, but including an auxilliary tuning device; and

Figures 3 and 4 represent typical digital waveforms produced by the apparatus of the invention.

Figure 1 shows a master television receiver R whose low frequency magnetic fields, such as emanate from the loudspeaker transformer or cathode-ray tube yoke, induce a signal in loop L. The induced signal is unique to the video/audio signal content of the channel to which receiver R is tuned. The induced signal is amplified and shaped into a digital pulse train by amplifier wave shapes A1. The output of A1 fires monostable multivibrator MS1 on receipt of an impulse generated by master receiver R. The Q output of MS1 is fed to one input of gate G acting as a coincidence detector.

Slave receiver S is sequentially tuned to all available channels on instructions received from

micro-processor MP. MP produces a series of analogue tuning voltages causing slave receiver S to advance sequentially from one channel to the next. Slave receiver S thus searches through all channels and provides signals to amplifier/demodulator IF, which signals are characteristic of the video/audio content of the particular channel to which S is tuned at any time. Amplifier/wave shaper A2 produces a digital pulse train of like kind to the pulse train produced by A1.

The slave pulses fires monostable multivibrator MS2, which acts as a variable delay circuit. The duration of the delay is controlled by potentiometer R_1, and typically can be set at 0-100 µsecs. At the end of the delay period, the $\overline{Q}$ output of MS2 fires monostable MS3, whose Q output is fed to the second input of gate G.

Referring now to Figure 4, (a) indicates the master pulses emanating from MS1, which pulses are about 0.3 µsec in length, and (b) indicates the slave pulses emanating from MS3, and are about 0.1 µsec in length. Potentiometer R_1 is used to set the delay of pulses (b) so that they fall within the duration of master pulses (b), as shown in Figure 4, thus producing coincidence.

When MS1 and MS3 fire at the same time, the resulting output of gate G fires retriggerable monostable multivibrator MS4. Sustained coincidence of pulse trains into gate G causes the $\overline{Q}$ output of MS4 to remain low, and this condition is recorded in memory M or fed through port I/O to an external recording apparatus.

If there is no coincidence, there is no output from gate G, the $\overline{Q}$ output of MS4 goes high and triggers the microprocessor MP to switch slave tuner S through all channels until coincidence again occurs.

Referring now to Figure 2, the apparatus is the same as that shown in Figure 1, but includes an auxiliary tuning device VCR/CT interposed between the source of transmission (antenna/cable) and master receiver R. The auxilliary device could be a video cassette recorder (VCR), or a cable television tuner (CT). In both instances, the master

receiver is permanently tuned to a special channel and the channel to be viewed is selected by the appropriate controls on the VCR or CT. The resulting time delay in the pulses is shown in Figure 3, where (b) represents slave pulses without VCR/CT, and (c) represents slave pulses with VCR/CT. As can be seen, with the VCR/CT, pulise train (c), the slave pulses arrive at gate G earlier than the master pulses (shown in dotted lines) and coincidence therefore cannot occur. This problem is overcome by broadening the master pulses (a) by adjustment of potentiometer R_2 associated with MS1, so that the slave pulses will fall within the duration of the master pulses regardless of the presence of a VCR/CT.

Thus the use of digital techniques and the setting of appropriate delays enables the monitoring apparatus to be used with or without auxilliary tuning devices interposed between source and master receiver.

CLAIMS:

1. Apparatus for monitoring the channel to which a master television receiver is tuned, comprising means to produce a first pulse train characteristic of the video or audio content of the television channel to which the master receiver is tuned, means to produce a second pulse train characteristic of the video or audio content of the channel to which a slave receiver is tuned, means to compare the first and second pulse trains and produce a further pulse if the first and second pulse trains do not coincide, and means responsive to the further pulse to sequentially tune the slave receiver to the next available channel, characterized in that the duration of the pulses of the first pulse train are sufficient to enable the corresponding pulses of the second train to coincide with those of the first pulse train when the first pulses are delayed by passing through an auxilliary tuning device interposed between the source of the video signal and the master receiver.

2. The apparatus of claim 1, wherein the means to produce the first pulse train includes a monostable multivibrator which can be adjusted to alter the duration of the pulses.

3. The apparatus of claim 1, wherein the means to produce the second pulse train includes two monostable multivibrators adjustable to introduce a time delay to compensate for the time delay of the first pulse train when it passes through the auxilliary tuning device.

4. The apparatus of claim 1, wherein said means to compare the first and second pulse train comprises a logic gate, which is enabled during a pulse of the first pulse train, and is activated when pulses of the second pulse train coincide.

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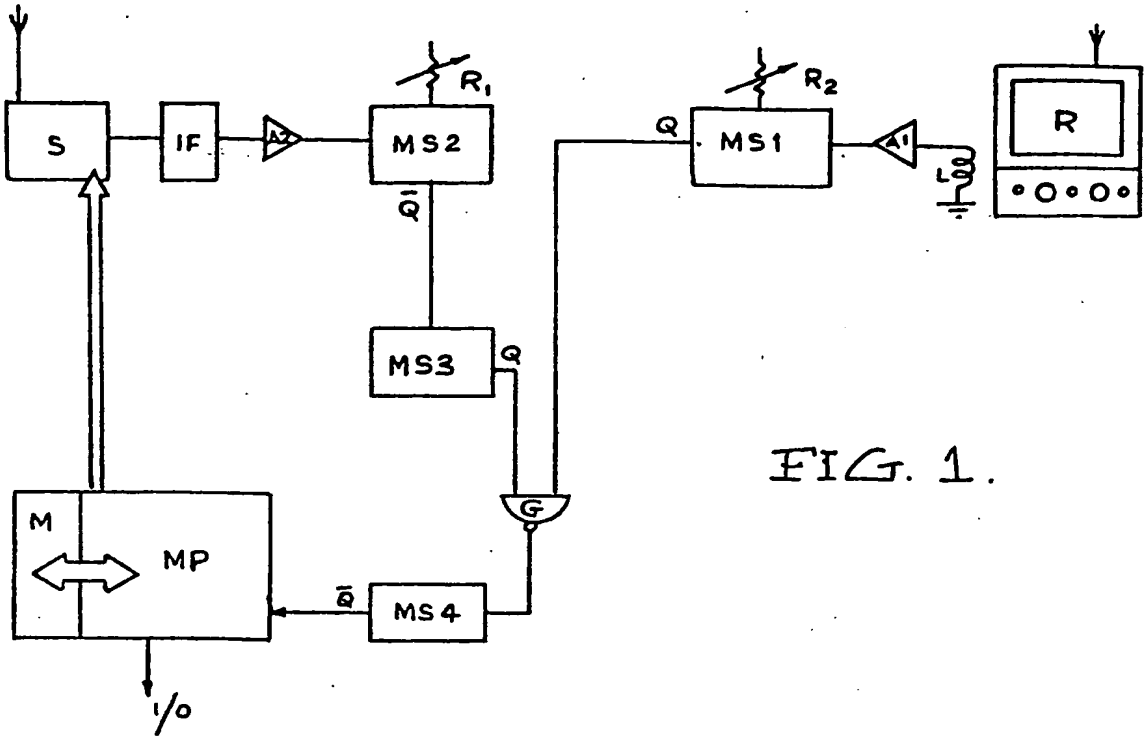

FIG. 1.

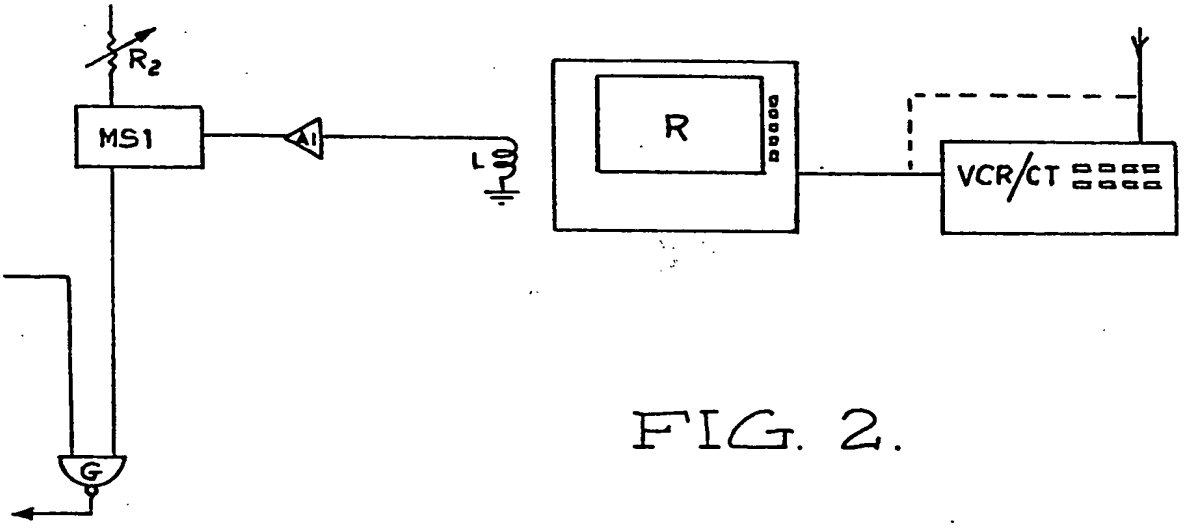

FIG. 2.

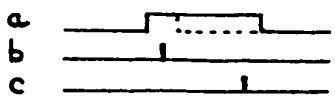

FIG. 3.

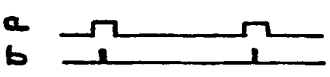

FIG. 4